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NONCOMBUSTIBLE PLASTERBOARD FROM FIBERGLASS LAYER

[Nichtbrennbare Gipsbauplatte mit Glasfaserlage]

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Examination request according to § 44 Patent Law has been filed.

Claims

1. Noncombustible plasterboard plate where the core is formed from a pasty, aqueous mixture based on gypsum; this plasterboard is coated with or joined to a fiberglass layer, in particular a chopped strand mat, sealed against the penetration of the aqueous mixture [sic], whereby the aqueous mixture has penetrated into it [sic], and the outside of the glass fiber layer is provided with a coating of plastic resin adhesive and an additional material, characterized in that the other material

distributed uniformly over the outside of the glass fiber layer (5), is a fine-grain, inorganic material (9) that changes upon application of heat under consumption of energy, and the glass fiber layer (5) provided with this coating (7) is at least poorly inflammable and has an air permeability of at least 20 l/m² · second and of most 1,400 l/m² · second.

2. Plasterboard plate according to Claim 1, characterized in that at least 98% by weight of the fine-grain, inorganic substance has a grain size of less than 0.2 mm.

3. Plasterboard plate according to Claims 1 or 2, characterized in that the fine-grain, inorganic substance has an average grain size of between 5 μm and 70 μm.

4. Plasterboard plate according to Claim 1, 2 or 3, characterized in that the fine-grain substance releases water vapor when heated.

5. Plasterboard plate according to claim 4, characterized in that the fine-grain substance is gypsum (calcium sulfate dihydrate).

6. Plasterboard plate according to Claims 1, 2 or 3, characterized in that the fine-grain substance releases carbon dioxide (CO_2) when heated.

7. Plasterboard plate according to Claim 6, characterized in that the fine-grain substance is limestone, dolomite or magnesite.

8. Plasterboard plate according to Claims 1, 2 or 3, characterized in that the fine-grain substance expands when heated.

9. Plasterboard plate according to Claim 8, characterized in that the fine-grain substance is vermiculite or perlite.

10. Plasterboard plate according to Claim 4 or 8, characterized in that the fine-grain substance is a boron mineral like colemanite or pandermite.

11. Plasterboard plate according to one of the preceding Claims 1 to 10, characterized in that the fine-grain substance consists of a mixture of the products described in Claims 4 to 10.

12. Plasterboard plate according to one of the preceding claims, characterized in that the fine-grain substance is applied with a quantity of maximum 100 g/m² of glass fiber layer.

13. Plasterboard plate according to Claim 1, characterized in that the plastic bonding agent is a melamine resin, a polyvinylidene chloride or an ethylene-vinylacetate-vinylchloride-terpolymerizate.

14. Plasterboard plate according to one of the preceding Claims, characterized in that the plastic adhesive agent is applied with a quantity of maximum 60 g/m² of glass fiber layer.

15. Plasterboard plate according to one of the preceding claims, characterized in that the glass fiber layer provided with the coating, meets the criterion of noncombustibility.

16. Plasterboard plate according to one of the preceding claims, characterized in that the air permeability of the glass fiber layer is between 30 and 700 l/m² · second.

Description

The invention pertains to a noncombustible plasterboard plate, where the core is formed from a pasty, aqueous mixture based on gypsum. This plasterboard is coated with or joined to a fiberglass layer, in particular a chopped strand mat, sealed against the penetration of the aqueous mixture, whereby the aqueous mixture has penetrated into it, and the outside of the glass fiber layer is provided with a coating of plastic resin adhesive and an additional material.

In a known plasterboard plate of this type (DE-OS 20 08 744) a chopped strand mat is tightly joined to the core, whereby some plaster has penetrated into the chopped strand mat. During the processing of this plate, some wear off of the glass fibers will occur that can present an unpleasant stress for the processors, especially when employing manual laborers. This wear is prevented in a different version of the plasterboard plate. Now here, the chopped strand mat bears a paper coating on its outer side, that is usually glued to a synthetic resin bonding agent. This plasterboard plate is produced on the standard sectional, ground conveyor used for the manufacture of sandwich type gypsum plasterboard. Due to the coating, it forms no glass fiber particles during processing. Because of the paper covering, the plasterboard plate is classed neither as a class A1-DIN 4102 construction material (noncombustible) nor as noncombustible according to ISO-IS 1182-1979, because in testing in an oven at 750°C, inflammation did occur. It possesses a relatively low permeability to air or steam.

A plasterboard plate is also known (GB-OS 20 53 779) where a glass fiber layer permeable to the aqueous mixture is immersed deeply under vibration into an aqueous mixture forming the plate core, so that the mixture has penetrated through the glass fiber layer, and forms on the outer side, a coating of inorganic material. The coating of this plasterboard plate exhibits greater permeability for air and/or steam and is noncombustible. However, in the production of said plate, the vibration must be produced that fully immerses the glass fiber layer into the aqueous mixture, or that lets the aqueous mixture penetrate strongly through the glass fiber layer. The production cannot be carried out on a standard sectional, ground conveyor used in the manufacture of sandwich type plasterboard, since the forming station is completely different in this case.

One problem of the invention is thus to create a plasterboard plate of the type described above that is secured against wear off of glass fibers, where the noncombustibility and improved permeability to air and steam are achieved, and so that it can be manufactured on the standard plasterboard plate sectional ground conveyors. The plasterboard plate according to this invention, in solving these problems, is characterized in that the other material distributed uniformly over the outside of the glass fiber layer, is a fine-grain, inorganic material that changes upon application of heat under consumption of energy, and the glass fiber layer provided with this coating is at least poorly inflammable (class B1 DIN 4102) and has an air permeability of at least 20 $l/m^2 \cdot$ second and of at most 1,400 $l/m^2 \cdot$ second, measured according to DIN 53887, using a test surface of 20 cm^2 and a pressure difference of H 1 mb (100 Pa).

Due to the joining of poorly inflammable plastic resin adhesive and fine-grain, inorganic material, a coating is developed that allows the plasterboard plate to be classified as noncombustible. The fine-grain material according to this invention, is e.g. a gypsum material, vermiculite or limestone powder, and consumes thermal energy when exposed to heat. The coating per this invention, ensures good air permeability, noncombustibility and producability on standard sandwich type plasterboard sectional ground conveyors, while preventing the troublesome generation of glass fibers.

The fine-grain materials used per the invention, change their consistency under the influence of heat, whereby they absorb energy and thus inhibit the inflammation of the plasterboard plate. For example, under the influence of heat, vermiculite swells up considerably. Gypsum materials release water when exposed to heat. Powdered limestone releases CO_2 when exposed to heat. Now the term "fine-grain material" also means a powdered material. Quartz sand or other inert substances are not included in the invention.

The gypsum material of the mixture is that commonly used in plasterboard plates. The mixture contains for example, fibers and other constituents and is in a pasty, aqueous, sludgy condition. A standard manufacturing sectional ground conveyor, where the coated glass fiber layer is wound off a roller, will be described below. The glass fiber layer here, means a chopped strand mat, glass fiber batt, and composites of chopped strand mat and glass fiber batt or interlaid scrim. The consistency of the mixture and the density of the layer are tailored to each

other so that the plaster slurry does indeed penetrate deeply into the glass fiber layer, but not up to the coating of the layer.

The term "fine-grain" here means that the grain diameter as a rule is not greater than 0.2 mm. It is particularly useful and advantageous when the average grain size rests between 5 µm and 70 µm, preferably between 10 µm and 50 µm.

The enumerated, fine-grain substances are softer, or less sharp-edged than quartz sand. It is particularly useful and advantageous when the fine-grain substance is a crude vermiculite or crude perlite, because these substances swell up to several times their normal volume when heated, and thereby set up a heat-damping, protective coating on the surface.

An additional advantage arises from the use of gypsum or powdered limestone as fine-grain material. Gypsum releases water when heated, and limestone releases carbon dioxide. This process consumes energy and thereby reduces the fire behavior of the synthetic resin binding agent. It is quite especially advantageous and economical to use gypsum from flue gas desulfuring (REA) (scrubbers). The finely powered REA gypsum appears as moist filter cake and can be used without drying and grinding, as the starting material for the production of the coating material, by mixing it with the plastic resin dispersion and adjusting the consistency e.g. by addition of water.

The use of Colemanite or similar boron minerals, combines two advantages, since it releases both water and also expands with powerful increase in volume upon exposure to high temperatures.

The selection of the synthetic resin binding agent is also governed by the fire behavior. It should be poorly inflammable. Favorable compounds for this are melamine resins, polyvinylidene chloride, and also terpolymerizates of ethylene-vinyl acetate-vinyl chloride.

The synthetic resin adhesive can be applied to the desired thickness e.g. by using a wiper or roller. The quantity of synthetic resin adhesive to be applied per m² to the glass fiber layer will depend on the nature of the surface of the glass fiber layer, and also on the type and granulation of the fine-grain material. However, it is particularly useful for the synthetic resin adhesive to be applied in an amount of maximum 60 g/m² of glass fiber layer. Applied quantities between 10 and 50 g/m² are preferred.

For the production of the coated bonded fiber fabric, first the bonded fiber fabric will be produced in the usual manner, and it is then coated with a mixture of synthetic resin and inorganic material. The mixture will be wiped or rolled onto the surface of the bonded fiber fabric. As synthetic resin binding agent, we can use for example, melamine resins or polyvinylidene chloride. It would also be possible to use adhesive dispersions based on vinyl chloride-vinyl propionate-styrene-acrylate copolymers. The mass ratio between plastic resin and inorganic material will depend on the latter. For example, for vermiculites, only a little plastic resin is needed (10% and less), for finaly powdered gypsum, the percentage of synthetic resin is greater (30-70%).

The quantity per m², or the density of the applied, finely powdered substance, is governed for instance, by the desired

noncombustible properties. However, it is particularly useful and advantageous for the finely powdered material to be applied in an amount from 20 to 80 g/m². The glass fiber layer provided with the coating, should best meet the criteria of noncombustibility (class A2 - DIN 4102).

The air permeability is measured on the coated layer before bonding it to the plate core. As a measurement method, we use that of DIN 53887. The test surface of 20 cm² will be exposed to a pressure difference of 1 mb (100 Pa). It is particularly useful and expedient for the air permeability to be at least 30 l/m² · second, and at most 700 l/m² · second. These values enable a good and fast drying of the plasterboard plate after forming.

The armored glass fiber layer per the invention can be produced for example, by first applying the synthetic resin adhesive to the glass fiber layer, and then scattering on the finely powdered material. In a different type of manufacture, synthetic resin adhesive and finely powdered material are mixed, and then applied to the glass fiber layer. The synthetic resin adhesive is not a solid, complete coating that covers the outside of the glass fiber layer, but rather it only covers the outer-lying glass fibers. Although single grains of the fine-grain material can touch each other, the distance between neighboring grains is in the majority of cases, at least as great as the diameter of the largest grains.

Based on the figures, the invention will be explained in detail below. The figures show:

Figure 1: A schematic cross section through a plasterboard plate

Figure 2: A photograph of the top view of a section of one of the two surfaces of the plasterboard plate according to Figure 1, and

Figure 3: A schematic side view of the forming (shaping) station of a standard sectional ground conveyor for the manufacture of the plasterboard plate according to Figure 1.

According to Figure 1, a plasterboard plate has a core 1 that is coated on one surface with a glass fiber layer 2, that is formed by a glass filament interlaid scrim 3 and a chopped strand mat 4 glued to it.. The glass filament interlaid scrim 3 is embedded in the core 1 to bond this glass fiber layer 2 to the core.

At the other surface, the core 1 is coated with a glass fiber layer 5 in the form of a chopped strand mat that is bonded to the core, where its material when still in the liquid state, has penetrated into the chopped strand mat up to the dashed line 6.

This glass fiber layer 5 is provided on the outside with an armoring coating 7 against wear off of glass fibers and thermal effects. The armoring 7 is composed of a synthetic resin adhesive 8 that envelops or coats the single fibers of the glass fiber layer, whereby the structure of the surface of these coated fibers is enhanced. On this side, the grains of the fine-grain substance 9 are located; these grains are distanced from each other and held by the synthetic resin adhesive 8. Figure 2 shows the outermost fibers 10 and the fine grain material 9. The photograph in Figure 2 is an enlargement of about 1:100.

In accordance with Figure 3, the mixture used in the production of the gypsum core moves from a mixer 11 to a forming table 12 on which a glass fiber layer 2 is applied, that is unwound from a roll. A roller 14 located above and at the beginning of the belt conveyor 13, forms the mixture into an extruded plate 15. The other, strip-like glass fiber layer 5 will be pulled off a roll, run past the roller 14 and placed onto the upper side of the extruded plate 15. The extruded plate is then transported off with the belt conveyor 13. After hardening of the plaster, the lane can be cut to the desired plate lengths. The plates are then dried, squared and stacked.

Fig.1

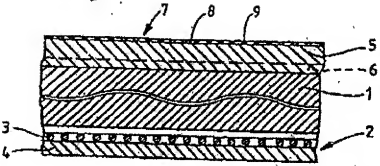


Fig.2

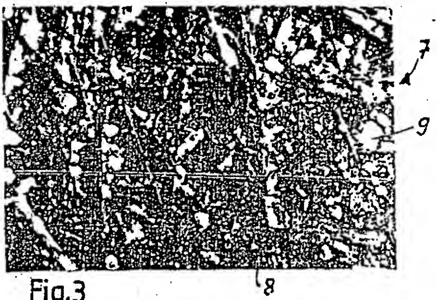
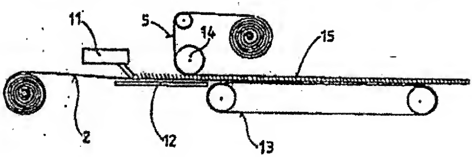


Fig.3



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